An innovative "concentrate and destroy" approach for water remediation by bismuth oxyhalides as adsorptive photocatalysts

SPEA11 — 11th European Conference on Solar Chemistry and Photocatalysis: Environmental Applications

Melissa G. Galloni,[1,2] **Veronica Bortolotto**,[1] **Elena Ferrara**,[1] **Daria C. Boffito**,[3] **Claudia L. Bianchi**,[1,2] **Ermelinda Falletta**[1,2]

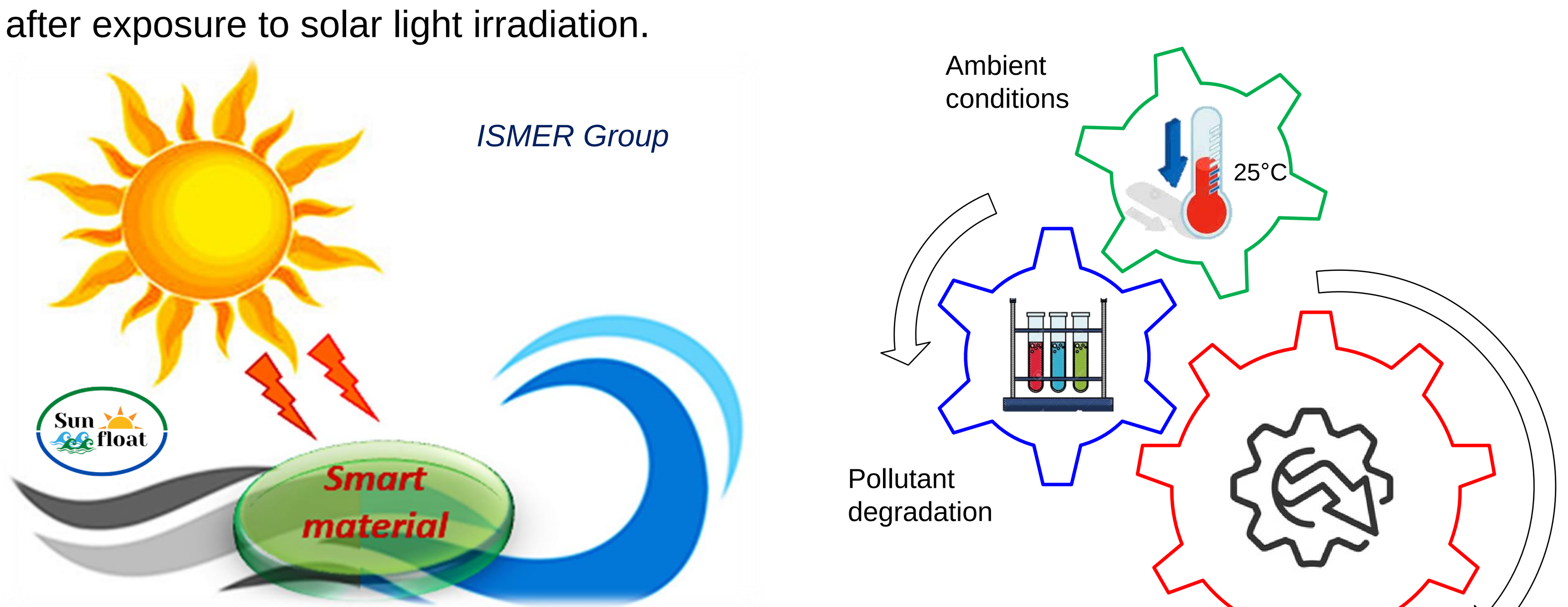
[1]Dipartimento di Chimica, Università degli Studi di Milano, Via Golgi 19, 20133, Milano, Italy;
[2]Consorzio Interuniversitario Nazionale per la Scienza e Tecnologia dei Materiali (INSTM), via Giusti 9, 50121 Firenze, Italy;
[3]Polytechnique Montréal – Génie Chimique 2900 Boul, Edouard Montpetit – H3T 1J4, Montréal, QC.

e-mail: melissa.galloni@unimi.it

Introduction

Environmental pollution, a hot issue in today's world, is mainly caused by toxic chemicals released in the air, water, and soil, and leads to the destruction of biodiversity and the degradation of human health. In this context, fast and efficient solutions are required: among the various possibilities, advanced oxidation processes (AOPs) offer important perspectives.[1,2]

Herein, we report our recent results in the use of bismuth oxybromide (BiOBr) as novel adsorptive photocatalyst able to concentrate on its surface two selected pollutants (rhodamine-B, RhB, and gallic acid, GA) also in the dark and degrade them quantitatively after exposure to solar light irradiation.



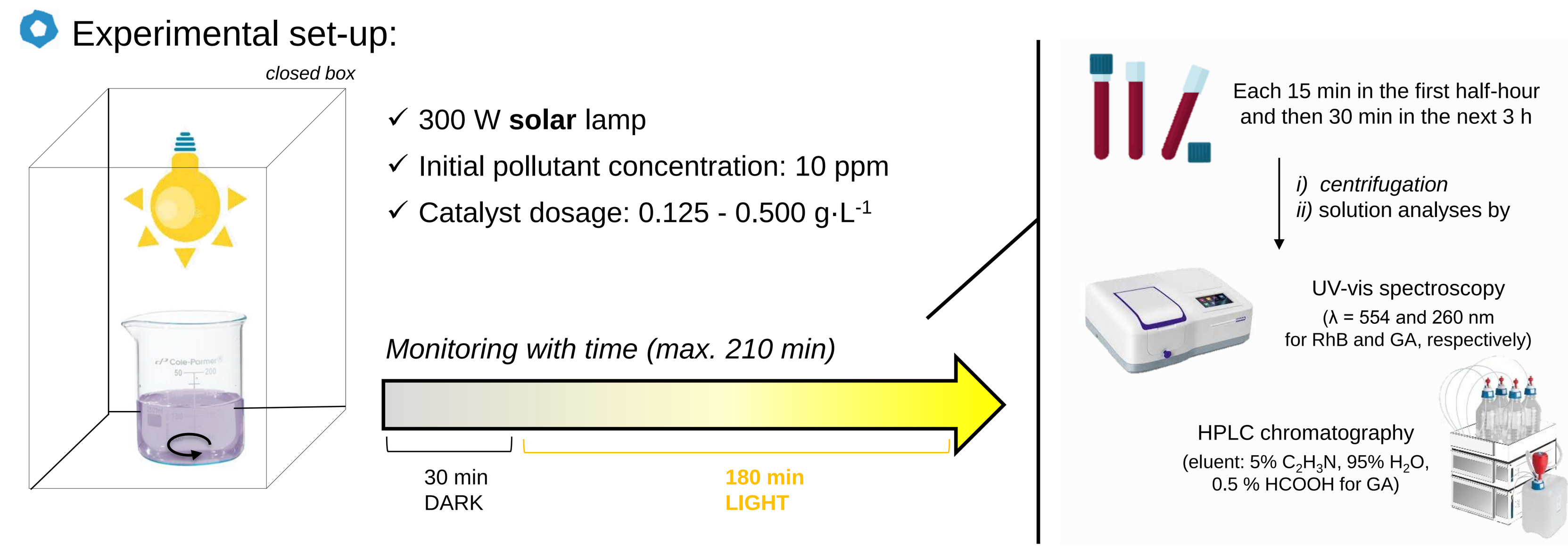
Advanced Oxidation Processes (AOPs)

- PHOTOCATALYTIC DEGRADATION -

Materials and Methodologies

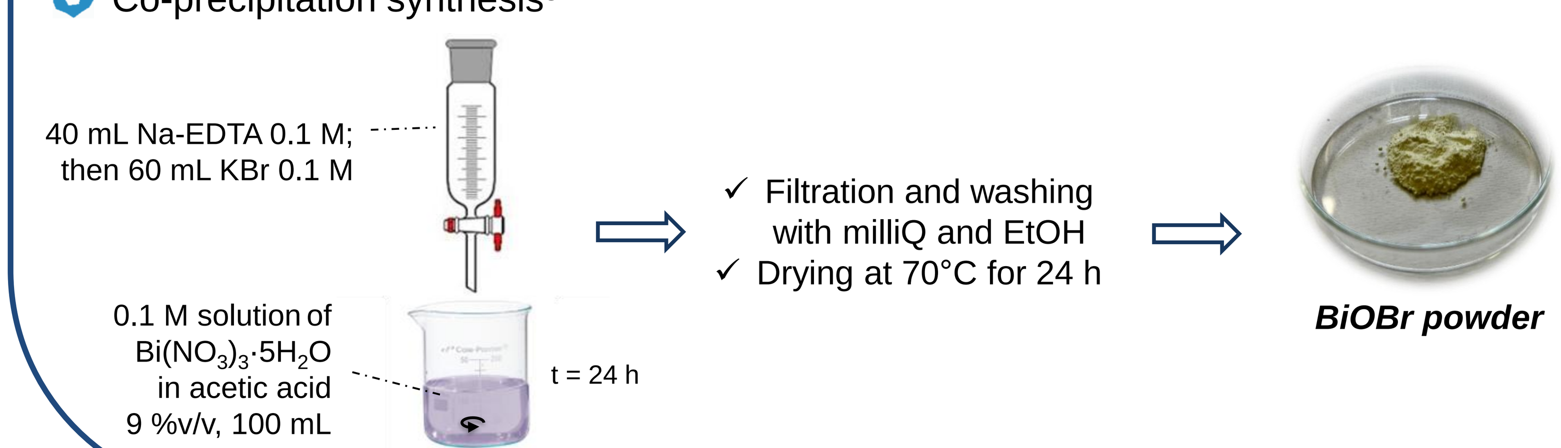
Photocatalytic tests: degradation studies of model pollutants

Experimental set-up:



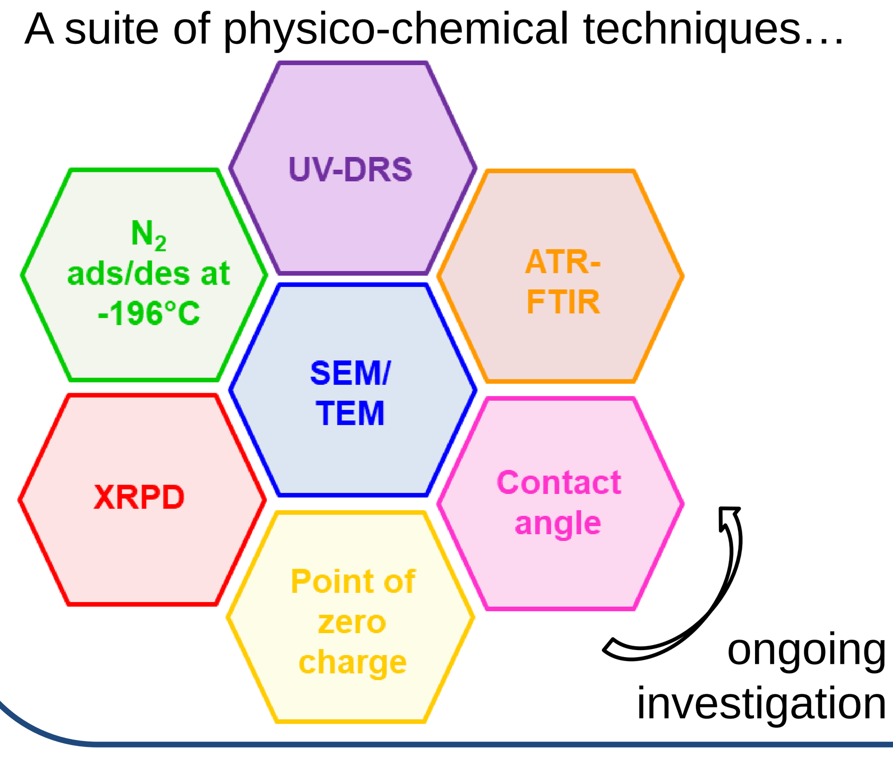
Preparation of bismuth oxybromide (BiOBr)

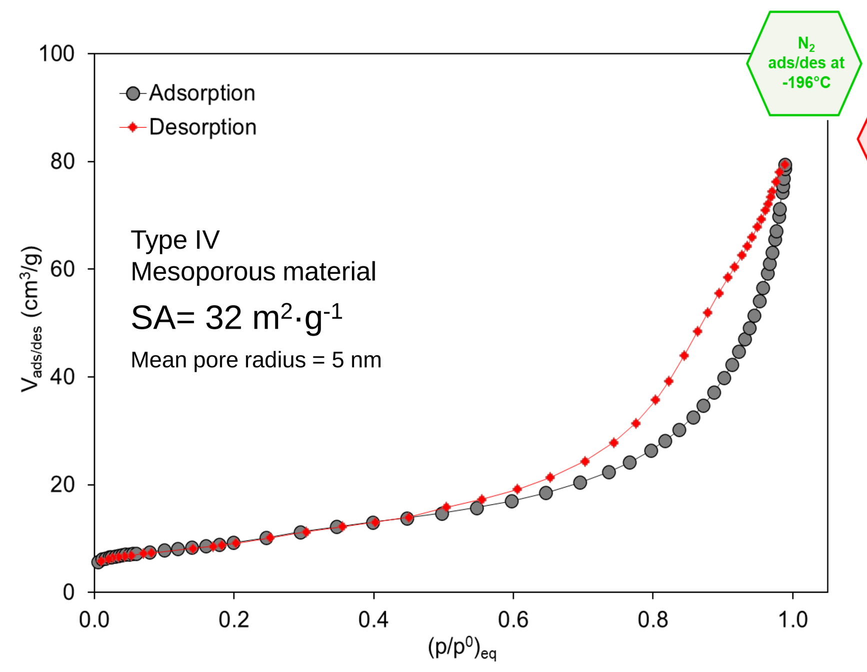
Co-precipitation synthesis[3]

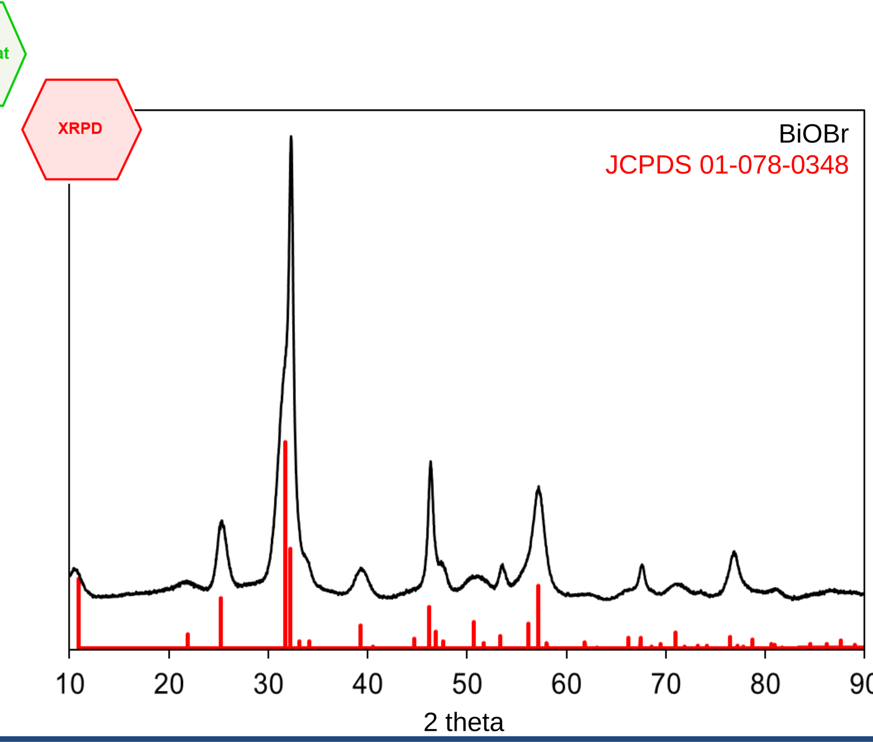


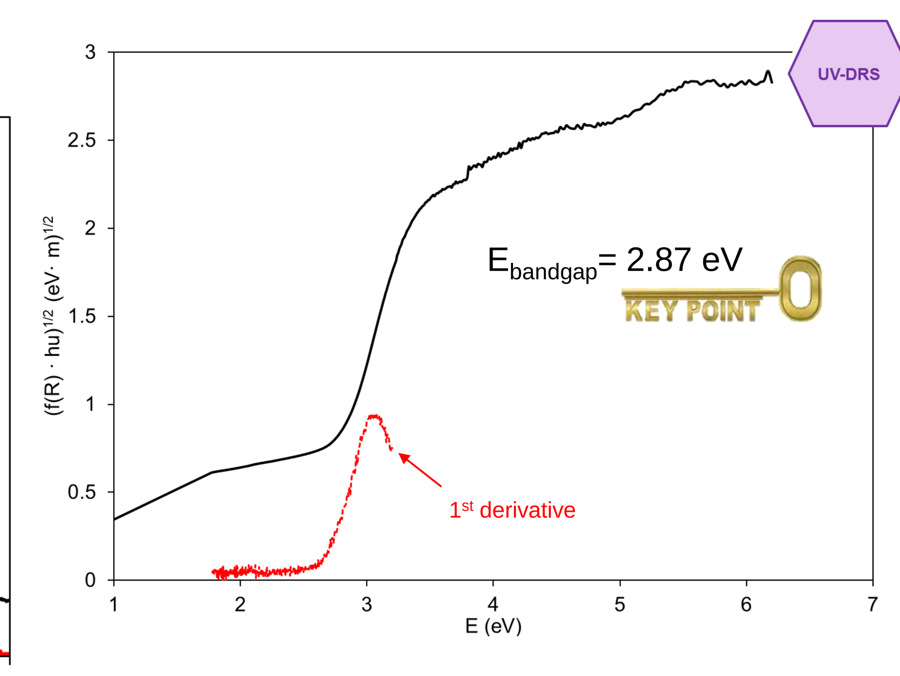
BiOBr characterization

A suite of physico-chemical techniques…



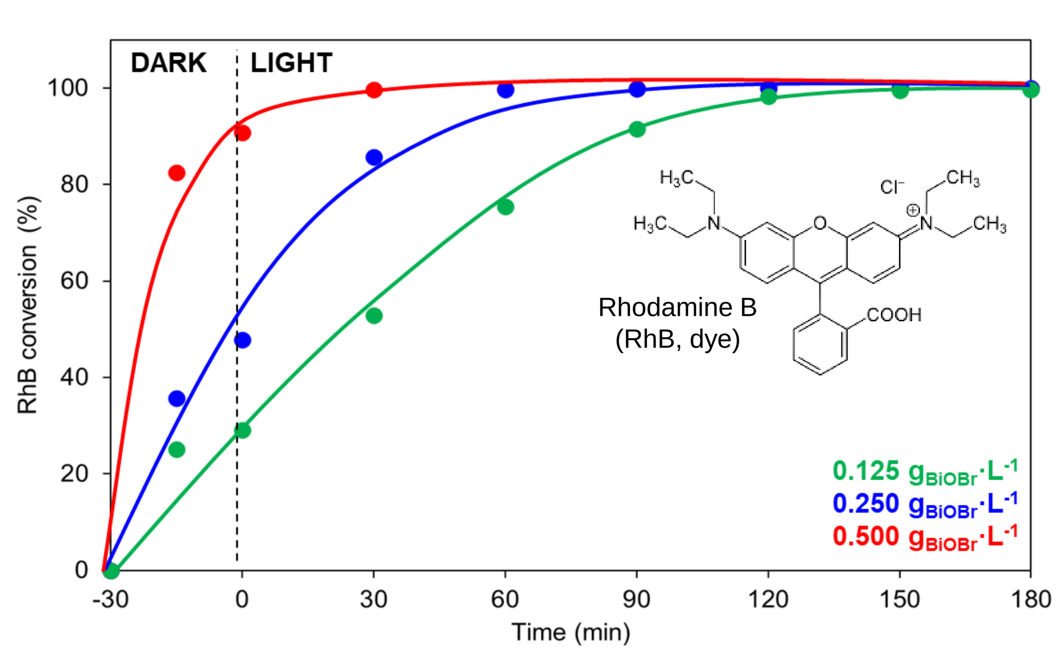


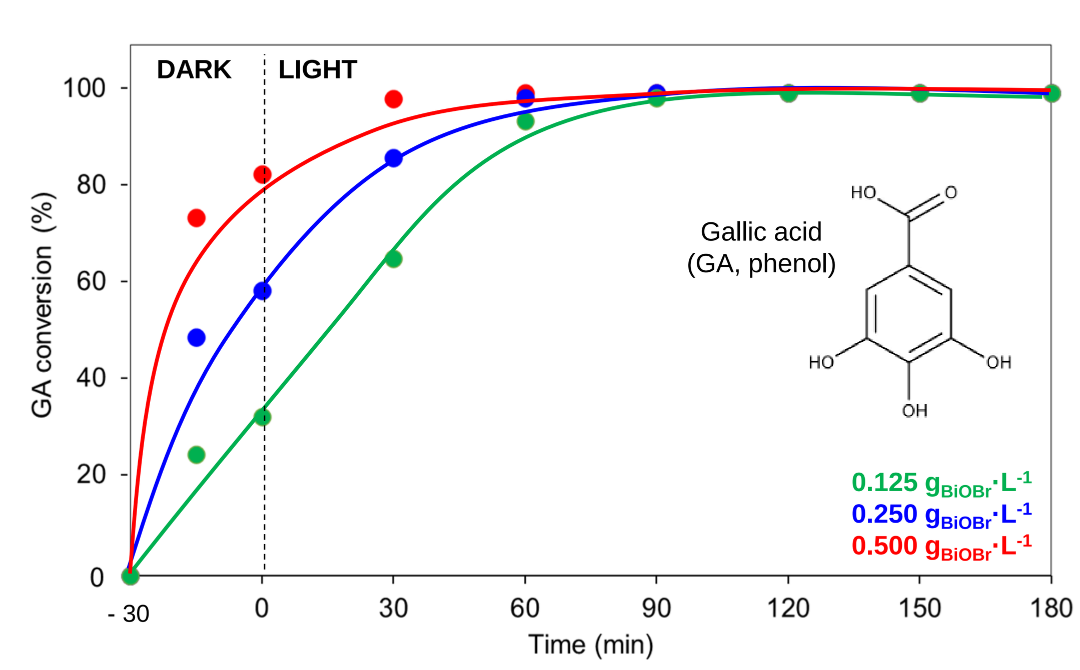




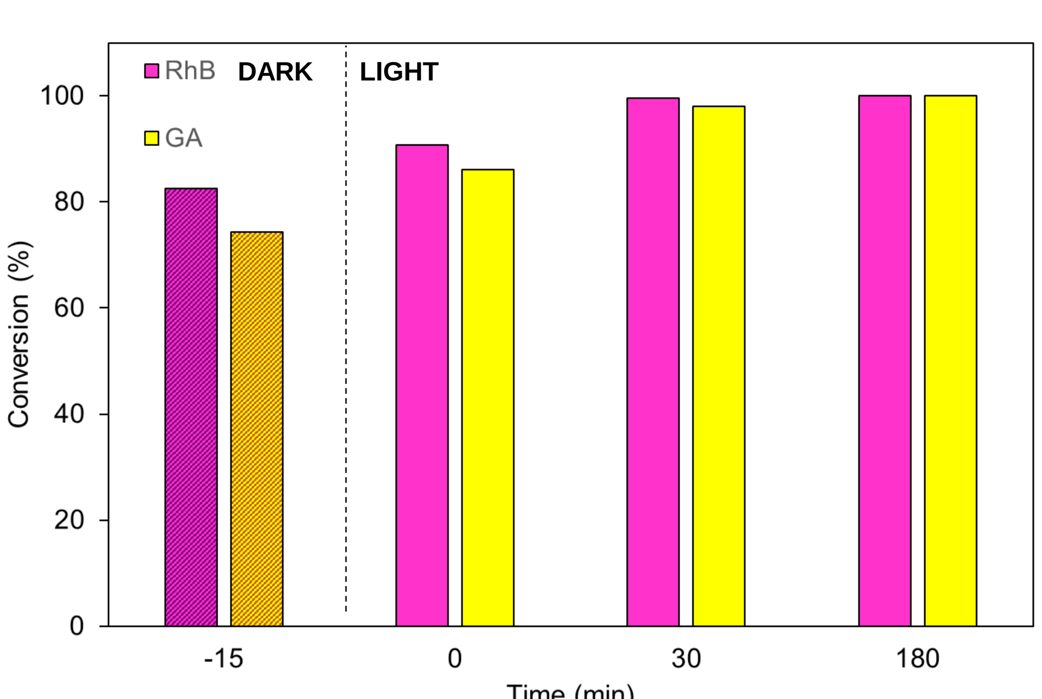
Photocatalytic activity

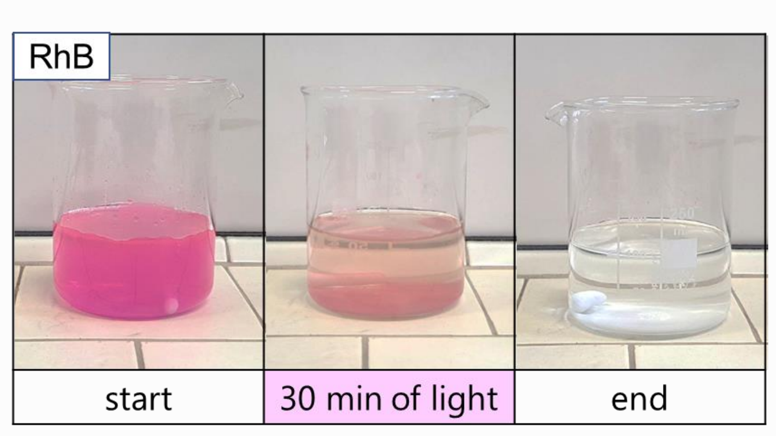
Effect of photocatalyst dosage

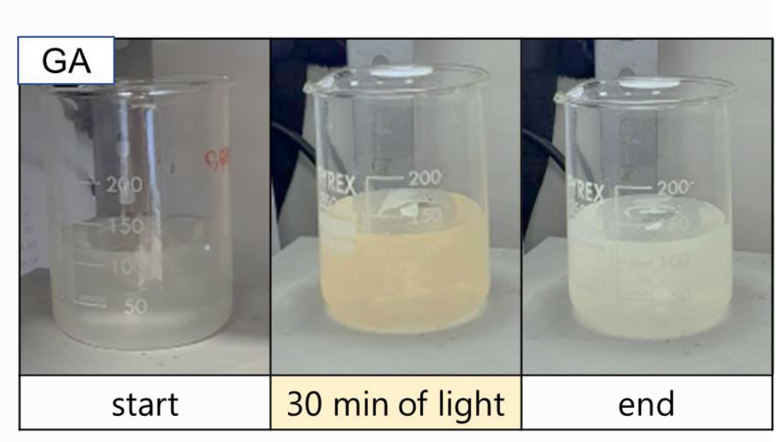




Comparison at fixed photocatalyst dosage (0.500 $g_{BiOBr}\cdot L^{-1}$)

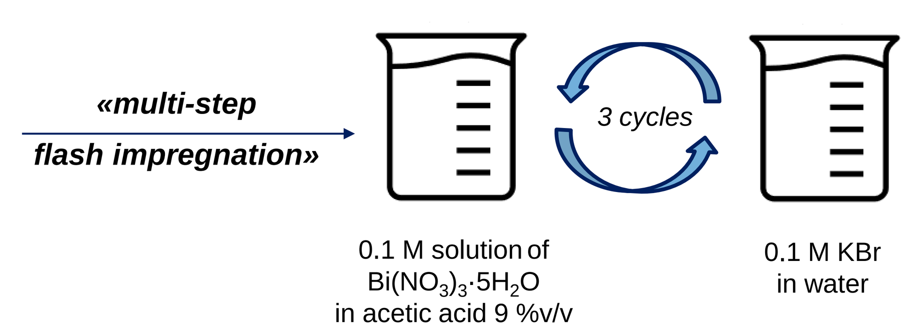




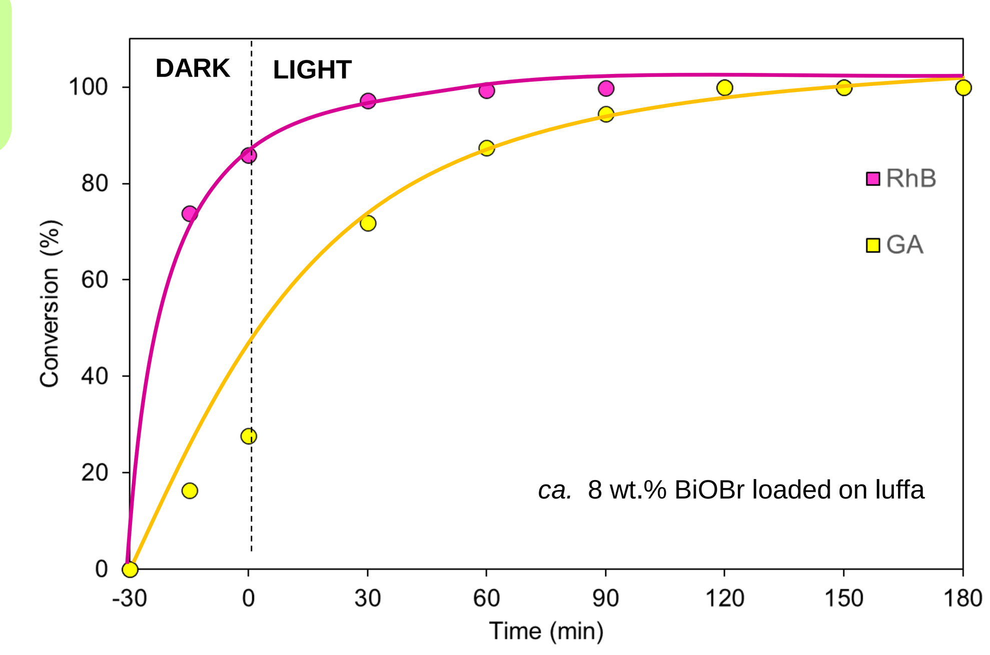


…moving to the real application in floating devices

Luffa cylindrica[4]



- ✓ Naturally available
- ✓ Non-toxic
- ✓ Low cost



Conclusions

BiOBr has been demonstrated to be a promising photocatalyst able to successfully degrade rhodamine-B and gallic acid. Preliminary studies in environmentally friendly floating devices revealed results of great significance.

Future efforts will be devoted to in-depth investigations in real applications.

REFERENCES

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https://sites.unimi.it/ClaudiaLBianchi/it/

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Velux Stiftung Foundation is gratefully acknowledged for the financial support through the project 1381 "SUNFLOAT-Water decontamination by sunlight-driven floating photocatalytic systems".
https://www.sunfloat.unimi.it/